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THE ELEVEN-AND-ONE-HALF-INCH EQUATORIAL TELESCOPE,

WASHBURN COLLEGE OBSERVATORY.

By H. L. Woods, Washburn College, Topeka.

Read before the Academy, at Topeka, January 1, 1903.

THE telescope lately erected in the new observatory of Washburn College is of very moderate size when compared with the many large instruments, However, it is hoped that a short description of it may be not entirely without interest. The objective has a clear aperture of 11½ inches and a focal length of 165 inches. The form of the lens is of the Herschel pattern, with no air space except that due to variation in the curvature of the surfaces. The glass was furnished by Mantois, of Paris, who also furnished the glass for the Lick and the Yerkes objectives. The lens was ground by Brashear, of Allegheny, Pa. There are five eyepieces, of the following powers: 120, 165, 220, 330, and 715. A helioscopic eyepiece is provided, and a wide-angle comet eyepiece of 150 power. The finder has an aperture of three inches and a power of twenty.

The column to the top of the declination head is ten feet in height. It is made in three sections, including the declination head. On the inside of the base, near the bottom, are cast lugs to support a floor of wood and concrete, which effectually prevents air currents from passing through the column. This has been found to be a protection to the clock in frosty weather, where, as is the case with this instrument, there is an open air space below the base. The second section contains the driving clock, and carries on its north side the R. A. dial and reading microscopes for the fine hour circle. The two sections of the column proper and the declination head are rigidly bolted together. Their aggregate weight is 2350 pounds.

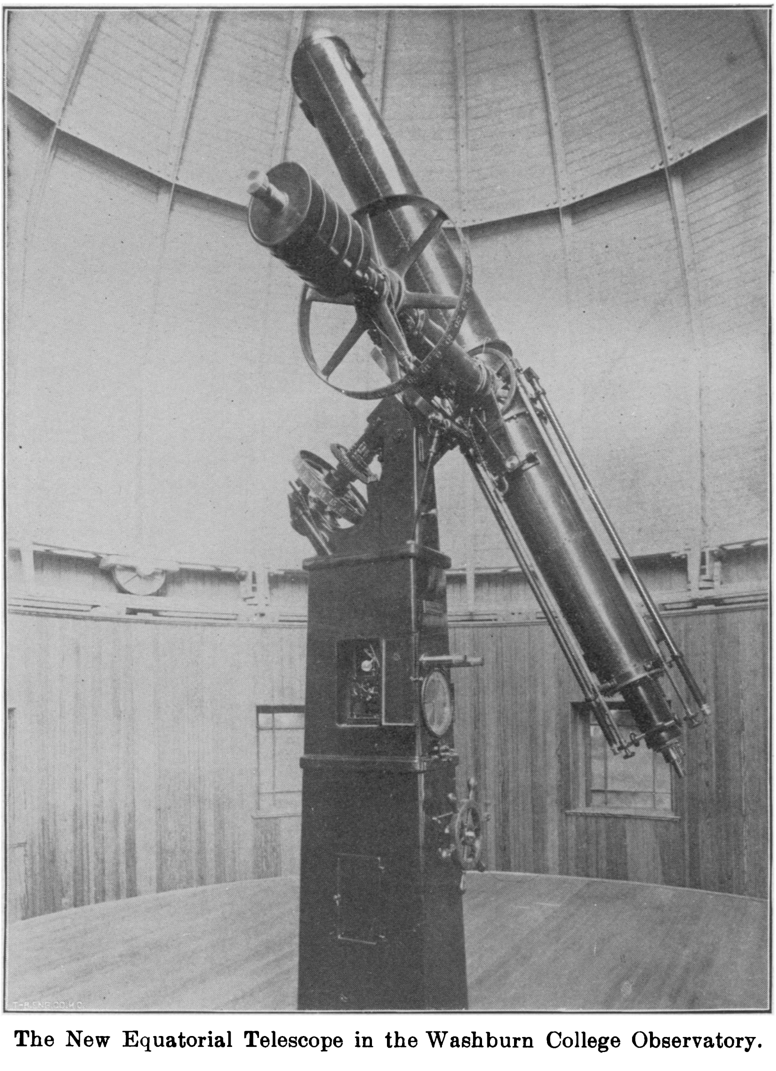
The thrust at the lower end of the polar axis is taken by ball bearings in phosphor-bronze casings. The upper end of the axis is carried by a phosphor-bronze bearing. The friction at this point is relieved by anti-friction rollers. The polar axis terminates in a head to which is attached by heavy screws the declination sleeve. Through this sleeve runs the declination axis, which in turn contains the rods for operating from the eye end of the telescope tube the clamp and slow motion on the polar axis.

The tube is of steel sheets closely riveted. The main draw-tube for focusing is operated by rack and pinion and carries a smaller draw-tube. Both tubes are provided with scales for locating proper positions for different uses of the instrument. Two weights sliding on rods which are attached by brackets to the eye end of the tube counterpoise the objective. The entire tube is counterpoised by five cylindrical weights which are threaded onto the opposite end of the declination axis. This system of counterpoises admits of very prompt and accurate balancing of the tube, called for by the addition or removal of accessories such as micrometer, spectroscope, or photographic attachments.

The system of circles for setting and for determining positions is very complete and convenient. The coarse hour circle near the lower end of the polar axis is divided to five minutes of time. Its graduations are easily visible from the floor. Setting in right ascension is, however, much more advantageously effected by a dial set into the north side of the column. The graduations on this dial read by a vernier to single minutes of time. The hand wheel for shifting the telescope rapidly in right ascension is situated just below the dial. The coarse declination circle is graduated to degrees and easily read from the floor or observing chair. The fine hour circle reads to five seconds of time, and is read by means of prisms through microscopes which project from the north side of the pier just above the R. A. dial. This arrangement permits the observer to read the fine hour circle and the setting dial and to operate the rapid motion without changing his position. The fine circle in declination reads by verniers to thirty seconds of arc and is read by microscopes at the eye end of the telescope.

All the circles and the R. A. dial are lighted by small incandescent lamps. The current is distributed and controlled in the following manner: The mains are brought up through the column to a switch just below the R. A. dial. This switch lights, as desired, the R. A· dial, the hour circle, or the coarse declination circle. The current for the hour and declination circles and the micrometer is carried through contact rings on the polar and declination axes. A switch at the eye end lights the fine declination circle or the micrometer. The lights are all carefully shaded, and may be left turned on, if desired, without interfering with observations.

The driving clock runs very smoothly and quietly. It is provided with a maintaining device which permits winding without disturbing the motion of the telescope. All the bearings of the clock, the connecting gears and the axes are exceedingly well fitted. This is attested by the fact that when the instrument was being set up, and before it was perfectly balanced and adjusted, the driving clock, with but seventy pounds of weights—one-half the full amount provided—maintained the motion of the telescope at nearly its required speed at



The New Equatorial Telescope in the Washburn College Observatory.

the very first trial. The weight of the movable parts of the telescope is about 1000 pounds.

The column and the tube are enameled in a dark green. Comparatively little brass is used in the construction. What is exposed is finely lacquered. In design, construction and finish the entire instrument is a fine specimen of mechanical skill. It received the grand prize at Paris in 1900, and the highest award at the Pan-American.

A few words concerning the support and housing of the instrument may be of interest. The base rests on two fifteen-inch I beams running north and south. Underneath these are two others of the same size running east and west. The observing floor, which is fixed, is eleven inches above the top of the upper beams.

The dome room is 21 feet 6½ inches in diameter. It is covered by a 26-foot copper-sheathed dome. The observing slit is 40 inches wide in the clear and is closed by a single shutter. The height from the observing floor to the center of the dome is 26 feet 9 inches.

The dome weighs about fifteen tons, and is carried on a steel track by twelve conical rollers with roller bearings. It is rotated by an endless wire cable passing over a sheave which is operated by a hand rope and pulley. A light pull with one hand is all that is required to shift the position of the dome.

Both telescope and dome were built by the Warner & Swasey Company, Cleveland, Ohio. The erection was under the charge of their representative, Mr. E. P. Burrell, whose skill and care in the work deserve special mention.